LISTING OF CLAIMS

I CLAIM:

1. (currently amended) A filled aperture reflecting telescope primarily used for deep space applications comprising:

a primary mirror comprising a plurality of modular segmented optics coupled to a modular mirror backing structure, wherein said modular mirror backing structure is formed from interlocking at least two of said a plurality of interlocking mirror backing structure segments;

a central hole defined within said primary mirror;

a secondary mirror operatively coupled to said primary mirror; and

an optical beam path ~~having an optional tertiary mirror~~, said optical beam path being operatively coupled to said secondary mirror through said central hole.

2. (currently amended) The reflecting telescope of claim 1, wherein each of said plurality of modular segmented optics comprises:

a front reflecting surface;

a backside;

a plurality of side surfaces defined by said front reflecting surface and said backside;

~~an optional~~ a front grapple fixture coupled to said front reflecting surface;

a flexible center attachment coupled to said backside;

a plurality of actuator attachments coupled to said backside;

~~an optional~~ a guide attached to said backside; and

~~an optional~~ a rear grapple fixture attached to said backside.

3. (original) The reflecting telescope of claim 2, wherein a first one of said plurality of modular segmented optics is coupled to an adjacent one of said plurality of modular segmented optics such that a first side surface of said first one of said plurality of modular segmented optics substantially abuts an adjacent side surface of said adjacent one of said

plurality of modular segmented optics and such that said front reflecting surface of said first one of said plurality of modular segmented optics forms a continuous surface with said front reflecting surface of said adjacent one of said plurality of modular segmented optics.

4. (original) The reflecting telescope of claim 1, wherein each of said modular interlocking mirror backing segments comprises:

at least one interlocking attachment(s), each of said at least one interlocking attachments having a plurality of side slots and a top region; and

a plurality of members coupled to at least one of said at least one interlocking attachments.

5. (original) The reflecting telescope of claim 1 further comprising a plurality of support connectors coupled to said secondary mirror and to said mirror backing structure.

6. (original) The reflective telescope of claim 1 further comprising an edge truss coupled around said modular mirror backing structure.

7. (original) The reflecting telescope of claim 6 further comprising a plurality of support connectors coupled to said secondary mirror and to said edge truss.

8. (original) The reflective telescope of claim 2, wherein each of said modular interlocking mirror backing segments comprises:

at least one interlocking attachment(s), each of said at least one interlocking attachments having a plurality of side slots and a top region; and

a plurality of members coupled to at least one of said at least one interlocking attachments, wherein said center attachment and each of said actuator attachments of each of said plurality of modular optics segments is coupled to a respective top region of said modular interlocking mirror backing segments.

9. (original) The reflective telescope of claim 8, wherein said center attachment is coupled to said top region of one of said at least one interlocking attachments.

10. (original) The reflective telescope of claim 8, wherein said at least one interlocking attachment comprises a plurality of interlocking attachments.

11. (original) The reflective telescope of claim 10, wherein said center attachment is coupled to said top region of one of said plurality of interlocking attachments and wherein each of said plurality of actuator attachments is coupled with a respective top region of another of said plurality of actuator attachments.

12. (original) The reflective telescope of claim 10 further comprising a multi-arm guide coupled between one of said plurality of modular optics segments and said mirror backing structure, said multi-arm guide comprising:

a central hub having an inlet region and a protruding region, said inlet region coupled to said center attachment and wherein said protruding region is coupled with a top surface of said at least one interlocking attachment; and

a plurality of arms extending radially from said central hub, each of said arms coupled over a respective one of said plurality of actuator attachments and seated onto at least one of said plurality of members.

13. (withdrawn) A filled aperture reflecting telescope primarily used for space applications comprising: a primary mirror comprising a plurality of coupled integrated modular segments, wherein each of said interlocking modular segments comprises a segmented optic coupled to a reaction structure using at least one face sheet actuator, said segmented optic comprises: a front reflecting surface; a backside and a plurality of side surfaces defined by said front reflecting surface and said backside; a central hole defined within said primary mirror; a secondary mirror operatively coupled to said primary mirror; and an optical beam path operatively coupled to said secondary mirror through said central hole, said optical beam path

having an optional tertiary mirror.

14. (withdrawn) The reflecting telescope of claim 13, wherein a first one of said plurality of integrated modular segments is coupled to an adjacent one of said plurality of modular segmented optics such that a first side surface of said first one of said plurality of integrated modular segments substantially abuts an adjacent side surface of said adjacent one of said plurality of integrated modular segments and such that said front reflecting surface of said first one of said plurality of integrated modular segments forms a continuous surface with said front reflecting surface of said adjacent one of said plurality of integrated modular segments.

15. (withdrawn) The reflecting telescope of claim 14 further comprising an external coupler used to couple said first one of said plurality of integrated modular segments to said adjacent one of said plurality of modular segmented optics.

16. (withdrawn) The reflecting telescope of claim 13 further comprising a plurality of support connectors coupled to said secondary mirror, each of said plurality of support connectors further being coupled to a respective different outermost one of said plurality of integrated modular segments, each of said outermost respective one of said plurality of integrated modular segments being located furthest from said central hole.

17. (withdrawn) The reflecting telescope of claim 13 further comprising a plurality of support connectors coupled to said secondary mirror, each of said plurality of support connectors further being coupled to a respective different outermost reaction structure of one of said plurality of integrated modular segments, each of said outermost respective one of said outermost reaction structures being located furthest from said central hole.

18. (currently amended) A method for forming a reflective telescope comprising:

providing a satellite having a foundation of an optical structure, said optical structure including an optical beam path ~~having an optional tertiary mirror~~;

forming a plurality of interlocking modular segments, each of said plurality of interlocking modular segments comprising a plurality of interlocking attachments and a plurality of members, wherein each of said plurality of interlocking attachments is coupled to at least one said plurality of members and wherein each of said plurality of members is coupled with at least one of said plurality of interlocking attachments;

forming a modular mirror backing structure by interlocking at least two of ~~from~~ said plurality of interlocking modular segments;

coupling said modular mirror backing structure to said foundation;

coupling a plurality of modular segmented optics one at a time to said modular mirror backing structure to form a primary mirror having a central hole; and

coupling a secondary mirror to said modular mirror backing structure, wherein said secondary mirror is operatively coupled to said primary mirror and is operatively coupled said optical beam path through said central hole.

19. (original) The method of claim 18, wherein forming a plurality of interlocking modular segments comprises:

providing a plurality of interlocking attachments, each of said plurality of interlocking attachments having a top region and a plurality of side slots;

providing a plurality of members having a first end and a second end;

introducing a first end of one of said plurality of members within a first side slot of one of said plurality of interlocking attachments;

introducing a second end of said one of said plurality of members within a first side slot of a second one of said plurality of interlocking attachments; and

introducing a first end of another of said plurality of members within a second side slot of said first one of said plurality of interlocking attachments.

20. (original) The method of claim 18, wherein forming a modular mirror backing structure from said plurality of interlocking modular segments comprises coupling a first end of one of said plurality of members of one of said plurality of interlocking modular segments

within a first side slot of another one of said plurality of interlocking modular segments; and

introducing a first end of another one of said plurality of members of said one of said plurality of interlocking modular segments within a first side slot of a third one of said plurality of interlocking modular segments.

21. (original) The method of claim 19, wherein coupling a secondary mirror to said modular mirror backing structure comprises:

providing at least one support connector, each of said at least one support connectors having a inner end and an outer end;

coupling an outer end of each of said at least one support connector to an outer side surface of said secondary mirror;

coupling an inner end of each of said at least one support connector to a respective one of said at least one interlocking attachments, each of said respective ones of said at least one interlocking attachment defining an outer periphery of said modular mirror backing structure.

22. (original) The method of claim 18 further comprising introducing said outermost end of each of said plurality of members defining said outer periphery within a corresponding inner side slot of an edge truss.

23. (original) The method of claim 22, wherein coupling a secondary mirror to said modular mirror backing structure comprises:

providing at least one support connector, each of said at least one support connectors having a inner end and an outer end;

coupling an outer end of each of said at least one support connector to an outer side surface of said secondary mirror;

coupling an inner end of each of said at least one support connector to a respective outer side slot of said edge truss.

24. (currently amended) The method of claim 19, wherein coupling a plurality of modular segmented optics one at a time to said modular mirror backing structure comprises:

(a) forming a plurality of modular segmented optics, wherein each of said plurality of modular segmented optics comprises a front reflecting surface; a backside; a plurality of side surfaces defined by said front reflecting surface and said backside; ~~an optional~~ a front grapple fixture coupled to said front reflecting surface; a flexible center attachment coupled to said backside; a plurality of actuator attachments coupled to said backside; ~~an optional~~ a guide attached to said backside; and ~~an optional~~ a rear grapple fixture attached to said backside;

(b) coupling a flexible center attachment of a first one of said plurality of modular segmented optics to a top region of one of said interlocking attachments; and

(c) coupling each of said plurality of actuator attachments of said one of said plurality of modular segmented optics to a respective top region of another of said plurality of interlocking attachments;

(d) repeating steps (b) and (c) for an adjacent one of said segmented optics, wherein a first side surface of said first one of said plurality of modular segmented optics substantially abuts an adjacent side surface of said adjacent one of said plurality of modular segmented optics and such that said front reflecting surface of said first one of said plurality of modular segmented optics forms a continuous surface with said front reflecting surface of said adjacent one of said plurality of modular segmented optics.

25. (original) The method of claim 24 further comprising (f) repeating step (e) for at least one more of said plurality of modular segmented optics.

26. (currently amended) The method of claim 24, wherein (b) coupling a flexible center attachment of a first one of said plurality of modular segmented optics to a top region of one of said interlocking attachments comprises:

providing a robot having a base structure having a control unit, an arm, and a grabbing structure, wherein said control unit controls the movement of said arm and said grabbing structure;

coupling said robot to said front grapple fixture of a first one of said plurality of modular segmented optics;

moving said arm of said robot towards said a plurality of interlocking modular segments;

moving said arm of said robot further towards said plurality of interlocking attachments to couple said center attachment to a respective top region of one of said interlocking attachments;

moving said arm of said robot further towards said plurality of interlocking attachments to couple said actuator attachment to a respective top region of a respective another one of said interlocking attachments;

moving said arm of said robot further towards said plurality of interlocking attachments until said ~~optional~~ guide is seated against one or more of said plurality of members; and

uncoupling said robot from said front grapple fixture.

27. (currently amended) The method of claim 24, wherein (b) coupling a flexible center attachment of a first one of said plurality of modular segmented optics to a top region of one of said interlocking attachments comprises:

providing a robot having a base structure having a control unit, an arm, and a grabbing structure, wherein said control unit controls the movement of said arm and said grabbing structure;

coupling said robot to said rear grapple fixture of a first one of said plurality of modular segmented optics;

moving said arm of said robot towards said a plurality of interlocking modular segments;

moving said arm of said robot further towards said plurality of interlocking attachments to couple said center attachment to a respective top region of one of said interlocking attachments;

moving said arm of said robot further towards said plurality of interlocking

attachments to couple said actuator attachment to a respective top region of a respective another one of said interlocking attachments;

moving said arm of said robot further towards said plurality of interlocking attachments until said ~~optional~~ guide is seated against one or more of said plurality of members; and uncoupling said robot from said rear grapple fixture.

28. (currently amended) The method of claim 19, wherein coupling a plurality of modular segmented optics one at a time to said modular mirror backing structure comprises:

(a) forming a plurality of modular segmented optics, wherein each of said plurality of modular segmented optics comprises a front reflecting surface; a backside; a plurality of side surfaces defined by said front reflecting surface and said backside; ~~an optional~~ a front grapple fixture coupled to said front reflecting surface; a flexible center attachment coupled to said backside; a plurality of actuator attachments coupled to said backside; ~~an optional~~ a guide attached to said backside; and ~~an optional~~ a rear grapple fixture attached to said backside;

(b) providing a plurality of multi-arm guides, wherein each of said plurality of multi-arm guide comprises a central hub having an inlet region and a protruding region, and a plurality of arms extending radially from said central hub;

(c) introducing said center attachment of one of said plurality of multi-arm guides within an inlet region of a multi-arm guide such that said plurality of arms are coupled over a respective one of said plurality of actuator attachments;

(d) coupling said multi-arm guide of a first one of said plurality of modular segmented optics to a top region of one of said interlocking attachments; and

(e) repeating steps (b) and (c) for an adjacent one of said segmented optics, wherein a first side surface of said first one of said plurality of modular segmented optics substantially abuts an adjacent side surface of said adjacent one of said plurality of modular segmented optics and such that said front reflecting surface of said first one of said plurality of modular segmented optics forms a continuous surface with said front reflecting surface of said adjacent one of said plurality of modular segmented optics.

29. (original) The method of claim 28, wherein (d) coupling said multi-arm guide of a first one of said plurality of modular segmented optics to a top region of one of said interlocking attachments comprises:

coupling said protruding region with a top surface of said at least one interlocking attachment such that each of said arms coupled over a respective one of said plurality of actuator attachments is seated onto at least one of said plurality of members.

30. (currently amended) A method for forming a space telescope comprising:

providing a satellite having a foundation of an optical structure, said foundation having an optical beam path having ~~an optional~~ a tertiary mirror;

forming a primary mirror having a central hole, said primary mirror comprising a plurality of coupled integrated modular segments, wherein each of said integrated modular segments comprises a segmented optic coupled to a reaction structure using at least one face sheet actuator;

coupling said primary mirror to said foundation, wherein said optical beam path is closely coupled with said central hole; and

coupling a secondary mirror to said modular mirror backing structure, wherein said secondary mirror is operatively coupled to said optical beam path through said central hole and is operatively coupled to said primary mirror.

31. (original) The method of claim 30, wherein forming a primary mirror comprises:

(a) providing a plurality of segmented optics, each of said segmented optics having a front reflecting surface, a backside, and a plurality of side surfaces defined by said front reflecting surface and said backside;

(b) providing a plurality of reaction structures;

(c) coupling at least one face sheet actuator to each of said plurality of reaction structures;

(d) coupling one of said plurality of segmented optics to a respective one of said

plurality of reaction structures using said one of said at least one face sheet actuator to form an integrated modular segment; and

(c) coupling one of said integrated modular segments to another of said integrated modular segments such that said front reflecting surface of said first one of said integrated modular segments forms a continuous surface with said front reflecting surface of said another one of said integrated modular segments and wherein a respective one of said side surfaces of said one of said integrated modular segments substantially abuts a respective one of said side surfaces of said another one of said integrated modular segments.

32. (original) The method of claim 31, wherein said one of said integrated modular segments is coupled to said another of said integrated modular segments using an external coupler.

33. (withdrawn) A method for forming a space telescope comprising:

forming a payload which can be launched into space;

forming a plurality of interlocking modular segments, each of said plurality of interlocking modular segments comprising a plurality of interlocking attachments and a plurality of members, wherein each of said plurality of interlocking attachments is coupled to at least one said plurality of members and wherein each of said plurality of members is coupled with at least one of said plurality of interlocking attachments;

forming a plurality of modular segmented optics;

introducing a portion of said plurality of interlocking modular segments and a portion of said plurality of modular segmented optics to said payload;

launching said payload into space orbit using a launch vehicle, said payload operating as a satellite and having a foundation and an optical structure, said optical structure including an optical beam path having an optional tertiary mirror;

forming a modular mirror backing structure from said portion of said plurality of interlocking modular segments;

coupling said modular mirror backing structure to said foundation;

coupling said portion of said plurality of modular segmented optics one at a time to said modular mirror backing structure to form a primary mirror having a central hole; and

coupling a secondary mirror to said modular mirror backing structure, wherein said secondary mirror is operatively coupled to said primary mirror and is operatively coupled to said optical beam path through said central hole.

34. (withdrawn) The method of claim 33, wherein a first one of said plurality of modular segmented optics is coupled to an adjacent one of said plurality of modular segmented optics such that a first side surface of said first one of said plurality of modular segmented optics substantially abuts an adjacent side surface of said adjacent one of said plurality of modular segmented optics and such that a front reflecting surface of said first one of said plurality of modular segmented optics forms a continuous surface with said front reflecting surface of said adjacent one of said plurality of modular segmented optics.

35. (withdrawn) The method of claim 33 further comprising increasing the size of said primary mirror by:

introducing at least one more of said plurality of interlocking modular segment to said modular mirror backing structure to form a larger modular mirror backing structure; and

introducing at least one more of said plurality of modular segmented optics one at a time to said larger modular mirror backing structure.

36. (withdrawn) The method of claim 35, wherein increasing the size of the space telescope comprises:

introducing a second portion of said plurality of interlocking modular segments and a second portion of said plurality of modular segmented optics to a second payload;

launching said second payload into space using a second launch vehicle;

docking said second payload to said satellite;

introducing at least one of said second portion of said plurality of interlocking modular segments to said modular mirror backing structure to form a larger modular mirror

backing structure; and

introducing at least one of said second portion of said plurality of modular segmented optics to said larger modular mirror backing structure.

37. (withdrawn) The method of claim 33 further comprising coupling an edge truss to an outermost end of each of said plurality of members defining an outer periphery of said modular mirror backing structure.

38. (withdrawn) A method for forming a space telescope comprising: forming a plurality of coupled integrated modular segments, wherein each of said integrated modular segments comprises a segmented optic coupled to a reaction structure using at least one face sheet actuator; introducing a portion of said plurality of coupled integrated modular segments to a payload;

launching said payload into space using a launch vehicle;

docking said payload to a satellite having a foundation for an optical structure, said optical structure including an optical beam path and an optional tertiary mirror;

coupling a plurality of said coupled integrated modular segments one at a time to said foundation to form a primary mirror having a central hole; and

coupling a secondary mirror to said modular mirror backing structure, wherein said secondary mirror is operatively coupled to optical beam path through said central hole and wherein said secondary mirror is operatively coupled to said primary mirror.

39. (withdrawn) The method of claim 38, wherein a first one of said plurality of integrated modular segments is coupled to an adjacent one of said plurality of modular segmented optics such that a first side surface of said first one of said plurality of integrated modular segments substantially abuts an adjacent side surface of said adjacent one of said plurality of integrated modular segments and such that a front reflecting surface of said first one of said plurality of integrated modular segments forms a continuous surface with said front reflecting surface of said adjacent one of said plurality of integrated modular segments.

40. (withdrawn) The method of claim 38 further comprising increasing the size of the primary mirror by:

introducing a second portion of said plurality of coupled integrated modular segments to at least one other payload(s);

launching each of said at least one other payload into space using a respective launch vehicle;

docking each of said at least one other payload one at a time to said foundation of said satellite; and

coupling said second portion of said plurality of coupled integrated modular segments one at a time to said foundation to increase the size of said primary mirror.

41. (withdrawn) The method of claim 38 further comprising:

coupling the operation of said space telescope with one or more additional satellites.

42. (withdrawn) The method of claim 38 further comprising:

providing one or more additional satellites in orbit; and

utilizing said one or more additional satellites to couple said plurality of said coupled integrated modular segments one at a time to said foundation to form a primary mirror having a central hole.

43. (new) The reflecting telescope of claim 1, further comprising a tertiary mirror contained within said central hole and coupled with said optical beam path.

44. (new) The method of claim 18, wherein said optical structure includes a tertiary mirror.